BACKGROUND OF THE INVENTION

The proposed system is intended to measure, remotely, the changing levels in primarily water-based fluid in an enclosed tank.

Many systems are currently available to provide a display of the level of the liquid in a tank.

U.S. Pat No. 5,705,747 to Bailey discloses a system and method of displaying a level of a liquid contained in a tank, wherein the level of the liquid is measured using a sensing device and includes a user interface, a processor, and a scaleable graphical display.

This is a complex, sophisticated system intended for a more demanding application requiring elapsed time related data and requires a special tank.

U.S. Pat No. 3.548,657 to Panerai et al, discloses a system which provides a vertical bar display representative of the level of the liquid using specific optical light-transmitting sensing device. The sensing device includes a plurality of optical reflection prisms simultaneously and uniformly illuminated by a luminous source located on one wall of the tank.

This is a complex, sophisticated system intended for a more demanding application requiring a special and elaborate sensing system pre fitted to the tank.

U.S. Pat No. 4.987,776 to Koon discloses a storage installation which is capable of storing a variety of free-flowing materials, both conductive and non-conductive, includes a level sensing device which may be disposed either exteriorly or interiorly thereof. The device has either one or a plurality of level sensor and sensor circuit pairs which are preferably disposed vertically within a non-electrically conducting tube which may be hermetically sealed from contact with the stored material. The level sensors comprise respective sensing capacitors, each having effectively a single plate construction. Grounded electrical contacts, if relatively adjacent, may comprise the other side of the effective sensing capacitor. Electrostatic force lines flow outward from the sensing capacitor(s), and are differentially interfered with by the presence or absence of materials or objects to be sensed. Such interference affects the dielectric constant of the respective sensing capacitor, which can in turn be detected to drive a level indicator display.

This is a capacitance sensing system, complex, sophisticated and intended for a more demanding application requiring a special and elaborate sensing system pre fitted to the tank. Also requires an oscillator.

U.S. Pat No. 4,780,705 to Beane discloses an overfill sensing system uses a capacitive sensor (12) on the interior of a tank for sensing the presence of a liquid to cease the filling

process. The capacitive sensor (12) includes a sensing capacitor (16) and a reference capacitor (18) on separate arms of a bridge circuit (22). An oscillator (28) supplies an AC signal to the bridge circuit (22) divided by a variable resistor (30) to balance the bridge (22). A comparator (24) receives the output on each arm of the bridge (22) to sense a differential therebetween. When a liquid reaches the sensing capacitor (16), the capacitance changes from a predetermined capacitance, thereby changing the differential. A control circuit (14) is responsive to the differential at the output of the comparator (24). for visually indicating the status of the filling process and ceasing the filling process from the filling facility when a liquid has been detected.

This is a capacitance sensing system, complex, sophisticated and intended for a more demanding application requiring a special and elaborate sensing system pre-fitted to the tank. Also requires an oscillator.

BRIEF SUMMARY OF THE INVENTION

It is thus the object of this invention to provide a simple system that fulfills a limited area of utilization. The proposed system provides an inexpensive, simple solution with no moving parts or special sensors and does not require access to the bottom of the tank, as in many cases, the tank is below ground or the problem of possible leaking has to be addressed. Unlike prior systems the invention can be fitted to a preexisting underground tank with limited access to the top of the tank and provides remote display over 300 feet from the tank being monitored. Also, as the invention is unique in its simplicity, it is restricted in its use as follows.

1. The fluid being monitored must have a conductivity greater than 16.3 μS/cm
2. The size of the tank must be known and fixed.
3. The fluid must not adhere excessively to the probe

This eliminates its use for most oil based products but has many applications in the domestic, agricultural and industrial arena as follows:

Successful tests have been carried out using this system with the following fluids:

Rain water	Tap-water	Ground water
Pond water	Well-water	Swimming pool water
Milk	Beer	Wine
Ammonia	Bleach	Liquid detergent
Liquid fertilizer	Insecticide	Vinegar
Waste water	Septic Water	

See table 3 and 4 for more detailed information.

A pre-calibrated probe specifically designed for the user's application is one of the key design features. The probe was designed to have the maximum invulnerability to problems of contamination encountered by other similar systems. Unfortunately the length of the probe has to be anticipated in accordance with the depth of the levels being measured but can be made available in standard sizes or made to order. The standard 5 foot version is detailed and the changes necessary for a 4 foot version also described. All have a standard 1 ¼ inch plumbing fitting. The system has been tested successfully to lengths over 300 feet and as small as 2 inches on the prototypes. It is anticipated that the users will be using standard sizes so mass production would not be a problem.

The probe consists of 10 conductive plates mechanically placed at 10% increments along the length of the probe. As the fluid level rises and falls successive contact is made to the plates and the remote display is illuminated in 10% increments. Digital data is available.

Other systems are generally more complicated and expensive and prone to failure in a hostile environment. This system is simple, inexpensive to produce, has no moving parts and does not use special sensors or transducers. The display electronics box with its power source can be at least 300 feet away from the measurement point providing true remote operation.